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(54) ALUMINIZED FILM FOR PACKAGING

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an aluminized film capable of holding the quality of packaged content over a long period of time.

SOLUTION: The aluminized film for packaging is constituted by applying aluminum to a plastic film by vacuum vapor deposition and characterized in that moisture permeability/1 m2.24 hr is <0.5 g under such a condition that atmospheric temperature is 40°C or higher and relative humidity is 90% or more and oxygen permeability/1 m2.24 hr is <0.5 cc under such a condition that atmospheric temperature is 23°C and relative humidity is 65% or more and the thickness of the aluminum layer is 2-100 nm.

CLAIMS

[Claim(s)]

[Claim 1]Are an aluminum deposition film for a package in which it comes to carry out vacuum deposition of the aluminum to a plastic film, and under not less than 40 ** of atmospheric temperature, and conditions of not less than 90% of relative humidity, Moisture transmittance of 24 hours is less than 0.5g per 1-m^2, and and under not less than 23 ** of atmospheric temperature, and conditions of not less than 65% of relative humidity, An aluminum deposition film for a package, wherein oxygen transmittance of 24 hours is less than 0.5 cc per 1-m^2 and thickness of an aluminum layer is not less than 2 nm 100 nm or less.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the aluminum deposition film for a package, especially the aluminum deposition film for a package which can save the quality of package contents at a long period of time.

[0002]

[Description of the Prior Art]From the former, the plastic film which gave vacuum deposition of aluminum is widely used as materials for a package. The typical deposition method of the vacuum deposition in such a field is physical vapor deposition. In in that case, the process which arranges crucible in a vacuum, gives and evaporates high temperature to the aluminum in crucible, rolls round the plastic film which serves as a substrate in the upper part, lets out from a roll, makes it run at high speed, and is rolled round again. The aluminum which evaporated is made to reach a film plane, it solid-content[cooling and]-izes to it, and the vacuum evaporation film is formed in it.

The crucible used as the evaporation source in this case is an open type type, and whatever the heat source, the aluminum which evaporated is designed and arranged so that all may be wide opened in a vacuum chamber promptly. In this case, the evaporation diffusion angle of aluminum is distributed over about 180 degrees (namely, **90 degrees) from the evaporation source by what is called a cos distribution law.

The radiation motion velocity of evaporation aluminum changes with positions of a diffusion angle.

It falls toward 0 from top speed as a radiation speed when going up vertically will be the quickest and will become level, if it is an evaporation source arranged horizontally.

[0003]The vacuum evaporation yield of the aluminum in this method is influenced by the traveling position of a film, and the more it is close to an evaporation source, the more yield improves. However, since an evaporation source is high temperature in one side, a film receives damage with heat. Then, the distance from an evaporation source must be taken to the position from which a film does not receive damage. When the example which is actually working widely is referred to, as shown in drawing 2, the shortest distance to a film from the evaporation source arranged horizontally temporarily at 500 mm. When the film is running by being held in the cooling roller of 1300 mmphi, the effective diffusion angle on the basis of a running direction will be about 70 degrees (namely, **35 degrees), and in that case, the longest distance from an evaporation source to a film will be about 900 mm, and will be 1.8 times the shortest distance. If the climbing speed in a position with a shortest distance of 500 mm is set to 1, the speed in a 35-degree position will fall to the 85% or less. Since the film is running, formation of a vacuum evaporation film begins from a position with a range of 900 mm of evaporation aluminum, and it completes in the 900-mm position by the side of reverse with beginning through a 500-mm position.

[0004]Thus, even if the evaporating aluminum atom is carrying out the free movement

in the formed vacuum evaporation film and it is the motion velocity in the case of the lift off which can obtain the quickest speed, Since the aluminum atom after reaching a film does not have sufficient kinetic energy (this serves as diffusion energy in a film surface) which is available to prepare a row mutual [atomic] by a film plane (that is, migration is realized), The packing density of an aluminum atom cannot but fall. Since the thickness of the aluminum layer which can be formed to one run also needs to protect a film from high temperature, it is very difficult to obtain the thickness of the aluminum layer of the wide range of not less than 2 nm 100 nm or less sufficient as an object for a package.

[0005]And since this aluminum deposition film has insufficient interception nature, such as moisture and oxygen, this aluminum deposition film is still weaker to physical impacts, such as friction, and it has a fault in which a vacuum evaporation aluminum layer separates easily, interception nature, such as moisture and oxygen, falls further. Therefore, as packaging applications of an aluminum deposition film, it is restricted to the design effects by being characterized mainly by gloss now, and the light blocking effect in the narrow range.

[0006]However, since one to pack is in the place which holds the quality of package contents over a long period of time as much as possible, though a light blocking effect is one of the elements which achieves the purpose, just it is not enough as it.

[0007]then, the high packing density of an aluminum atom being obtained, and the thickness of an aluminum layer being controlled by vacuum evaporation, and, It has interception capability, such as moisture which can hold the quality of package contents over a long period of time, and oxygen, and an aluminum deposition film which can hold the quality of package contents over a long period of time was desired.

[0008]

[Problem(s) to be Solved by the Invention]Then, this invention makes it a technical problem to provide the aluminum deposition film which can hold the quality of package contents at a long period of time.

[0009]

[Means for Solving the Problem]This invention persons found out that said technical problem was solved by the following means, as a result of inquiring wholeheartedly. Namely, this invention is an aluminum deposition film for a package in which it comes to carry out vacuum deposition of the aluminum to a plastic film, and under not less than 40 ** of atmospheric temperature, and conditions of not less than 90% of relative humidity, Moisture transmittance of 24 hours is less than 0.5g per 1-m^2, and and under not less than 23 ** of atmospheric temperature, and conditions of not less than 65% of relative humidity, Oxygen transmittance of 24 hours is less than 0.5 cc per 1-m^2, and thickness of an aluminum layer provides the not less than 2-nm aluminum deposition film for a package which is 100 nm or less. A film in particular is not what limited thickness here, and also when called a sheet, a certain thickness also contains a not less

than 100-micrometer thing, for example.

[0010]When evaporated aluminum formed and grows a vacuum evaporation core on a substrate (for example, film) in aluminum vacuum evaporation and also a vacuum evaporation film is formed through a process of condensation, after realizing row control of an aluminum atom, If an aluminum layer grows to predetermined thickness, packing density will become high and, as a result, the permeability of moisture or oxygen will fall. In order to realize membraneous control of an aluminum atom, speed at the time of an aluminum steam reaching a film has the speed which carries out an aluminum atom and is sufficient for exercising freely (that is, the migration effect is realized) in a film surface, Even if it is which position of a radiation angle, it is required for the speed for there to be no difference.

[0011]In an evaporation source for which lessons was taken from this and which was illustrated as a Prior art, the degree of radiation angle is about 180 degrees (namely, **90 degrees). If it is an evaporation source arranged horizontally, it is a range which reaches almost horizontally from a perpendicular, and if normal distribution of a radiation speed at that time is level when it is set to 1 in a vertical position, it is set to 0. Since an attenuating state of speed within this angle decreases with an angle with a peak of a vertical position, it can consider making only a range with little speed attenuation bombardment, but since material yield falls extremely, time which vacuum evaporation takes also becomes long.

[0012]Then, in this invention, sealed type crucible which has a nozzle is adopted on the occasion of the manufacture instead of crucible of an open sand mold adopted by conventional technology. In sealed type crucible, steam pressure can fully be raised inside. For example, if steam pressure in crucible in which inside of a vacuum chamber has a nozzle 1 mm in diameter with the level of Torr the 10-4th power becomes 1 Torr as shown in drawing 1, a radiation angle of an aluminum steam which blows off from crucible will be about 30 degrees (namely, **15 degrees). Material yield in this radiation angle is about 100%, and even if a radiation speed is a 0-degree position and it is a 15-degree position, it is almost the same. Although that an aluminum steam immediately after blowing off from a nozzle forms a radiation angle used as about 30 degrees (namely, **15 degrees) means that disorderly thermal energy is converted into translational energy of a jet direction, and adiabatic expansion, Thermal energy is taken in this process and tens to thousands of loose joint groups (aluminum atom clusters) of an aluminum atom are formed of the Juan Dell Wace power. And by irradiating these aluminum atom clusters with an electron from an electron gun, one aluminum atom in a cluster composition atom group loses one electron of an outermost shell, and converts it into a cluster ion of +1 value. An aluminum steam which goes up as a result becomes a group of aluminum atom clusters of +1 value, and neutral aluminum atom clusters which are not ionized. If an accelerating electrode is arranged in distance of a group of an aluminum atom cluster ion of speed obtained at the time of nozzle injection, and +1

value which exercises toward a film at per second about 600 to 800 m and negative accelerating voltage is impressed to it, a cluster ion will be accelerated further. It goes to a film at speed which a neutral cluster which was not ionized also obtained at the time of nozzle injection. Although this speed exceeds about 10 times of the highest climbing speed in open type-type crucible, If aluminum atom clusters reach a film plane, a cluster will collapse, Its smooth nature also improves as it is spread on a film plane, it is helped by effect of an electric charge which ion has, a vacuum evaporation film by which crystallinity was controlled is formed, and high packing density is realized as a result and thickness of each atom with this kinetic energy of an aluminum layer increases.

[0013]In sealed type crucible which has a nozzle, a radiation angle of an aluminum steam is about 30 degrees (namely, **15 degrees), and, moreover, material yield is also about 100% as stated previously. This means that distance between an evaporation source and a film can be taken suitably. It is not necessary to take into consideration decline in material yield, and a fall of a thickness formation speed of an aluminum layer by it like [in the case of open type-type crucible]. Therefore, if heat of an evaporation source takes distance to a position which does not have on a film, time can be given and thickness of a required aluminum layer can be obtained. And an aluminum deposition film for a package obtained by carrying out in this way, Are arbitrarily controlled so that thickness of an aluminum layer is set to not less than 2 nm 100 nm or less, and under not less than 40 ** of atmospheric temperature, and conditions of not less than 90% of relative humidity, Moisture transmittance of 24 hours is less than 0.5g per 1-m^2, and oxygen transmittance of 24 hours is less than 0.5 cc per 1-m^2 under not less than 23 ** of atmospheric temperature, and conditions of not less than 65% of relative humidity.

[0014]

[Embodiment of the Invention]Hereafter, it explains more concretely about an embodiment of the invention. Although the plastic film in particular used for this invention is not limited, general-purpose plastic films, such as polyester and polypropylene, can be used for it, for example. This plastic film cannot be concerned and can be used for what was extended, an unextended thing, and the thing which performed other processings. For example, it receives that the biaxially oriented polyester film which cannot be influenced comparatively easily by heat was widely used in the conventional vacuum deposition, and biaxial-stretching polypropylene with difficult vacuum evaporation was not used that it is easy to contract under the influence of heat, In the aluminum deposition film for a package concerning this invention, aluminum vacuum evaporation can be given as well as biaxial-stretching polyester by adopting the method clarified by the means of problem solving also to plastic films, such as biaxial-stretching polypropylene which is easy to be influenced by heat.

[0015]About the method of this aluminum vacuum evaporation, the method of using the sealed type crucible which has a nozzle is used. As for the crucible used in that case, it is preferred to select the construction material which does not cause aluminum and a

chemical reaction. The diameter of a nozzle, length, shape, etc. change with pressures obtained within crucible. And the pressure in this crucible changes with heating energies, and the pressure in crucible is proportional to the size of heating energy in more detail, and an electron irradiation method tends to acquire high temperature about a heating method than a resistance method. A tungsten filament is heated and ionization is performed by irradiating with a thermal electron, for example. In that case, the electrode disposition which avoids converging on the aliquot to the aluminum atom clusters which pass through an irradiation position is required. And after taking the whole potential difference into consideration, it opts for arrangement of the accelerating electrode for accelerating movement of the aluminum atom clusters made to ionize. All the optimal conditions are determined from a nozzle on the basis of the ability to be obtained [how many jetting volume] per unit time. And the aluminum deposition film for a package concerning this invention can be easily manufactured by vapor-depositing aluminum to a plastic film using the sealed type crucible in which this nozzle was provided.

[0016]The aluminum deposition film for a package concerning this invention can be used like other films for a package. For example, it can be used, being able to replace the aluminum deposition film concerning this invention with the aluminum foil of the package specification which is using aluminum foil. The aluminum foil of a pouch-packed food can be changed into the aluminum deposition film for a package concerning this invention. The aluminum foil currently used for the lid of a container can be changed into the aluminum deposition film for a package concerning this invention.

[0017]

[Effect of the Invention]The aluminum deposition film for a package concerning this invention, Thickness under with a [not less than 40 ** of atmospheric temperature and not less than 90% of relative humidity] which are the performance which is [abbreviated-] equal to around 9-micrometer aluminum foil conditions, The moisture transmittance of 24 hours per 1-m^2 under less than 0.5g and not less than 23 ** of atmospheric temperature, and the conditions of not less than 65% of relative humidity, Since the oxygen transmittance of 24 hours has the performance below 0.5 cc per 1-m^2, it is suitable as a charge for a package of a film material, and it becomes easy to save the quality of package contents at a long period of time. And package cost can be made cheap by replacing this aluminum deposition film for a package with aluminum foil, and using it. The burden to the environment of solid content (aluminum etc.) decreases in abandonment of the film after use. that is, it is because vacuum evaporation demonstrates the effect by the thickness of an about 100-nm aluminum layer also as a raw material, so it becomes the discarding quantity of the solid content of about 1/100 about the same aluminum as aluminum foil as compared with the aluminum foil whose thickness is 9 micrometers, for example. As mentioned above, by adopting the

aluminum deposition film for a package concerning this invention as the package accompanying the necessaries of almost all the every day, reduction of total cost also including abandonment can be realized and it can also contribute to maintenance of natural environment.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The key map of the manufacture course of the aluminum deposition film for a package concerning this invention.

[Drawing 2]The key map of the manufacture course of the aluminum deposition film for a package from the former.